

EXHIBIT A

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MAR 24 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
James Richard Spears et al.

Serial No.: 09/632,530

Filed: August 4, 2000

For: Apparatus and Method for Oxygenating
Wastewater

§ Confirmation No.: 1489
§ Group Art Unit: 1724
§
§
§ Examiner: Barry, Chester T.
§
§
§ Atty. Docket: PA074-US
§

Commissioner for Patent
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF MAILING

37 C.F.R. 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patent, P.O. Box 1450, Alexandria, VA 22313-1450, on the date below:

October 4, 2004
Date

Tamara J. McGovern
Tamara J. McGovern

AMENDMENT

Sir:

In response to the Office Action dated June 2, 2004, please amend the above-referenced application as follows:

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 11 of this paper.

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Amdt. dated October 4, 2004
Application Serial No. 09/632,530
Reply to Office Action of June 2, 2004

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AMENDMENTS TO THE CLAIMS

Listing of Claims

Claim 1 (currently amended): An apparatus for treating a wastewater comprising:
a gas-enrichment assembly adapted to receive the wastewater and a treatment gas, wherein the gas-enrichment assembly is configured to generate a gas-enriched fluid wherein the gas-enriched fluid is gas-supersaturated by the treatment gas; and
a delivery assembly coupled to the gas-enrichment assembly for receiving the gas-enriched fluid from the gas-enrichment assembly and in fluid communication with the wastewater, the delivery assembly expelling the gas-enriched fluid in a substantially bubble-free manner into the wastewater and capable of raising the concentration of the treatment gas in the wastewater to hyperbaric levels.

Claim 2 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises municipal reservoir water.

Claim 3 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises industrial waste.

Claim 4 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises lake/pond water.

Claim 5 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises river/stream water.

Claim 6 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises sewage.

Claim 7 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises stormwater runoff.

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Claim 8 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises ground water.

Claim 9 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises aquacultural waters.

Claim 10 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises marine hatchery waters.

Claim 11 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises agricultural waste.

Claim 12 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises pesticides.

Claim 13 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises fertilizers.

Claim 14 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises heavy metals.

Claim 15 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises microorganisms.

Claim 16 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises air.

Claim 17 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises oxygen.

Claim 18 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises ozone.

Claim 19 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises hydrogen.

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Claim 20 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises chlorine.

Claim 21 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises carbon monoxide.

Claim 22 (withdrawn): The apparatus of claim 1, wherein the gas-enriched fluid is approximately gas-saturated by the treatment gas.

Claim 23 (withdrawn): The apparatus of claim 1, wherein the gas-enriched fluid is gas-supersaturated by the treatment gas.

Claim 24 (withdrawn): The apparatus of claim 1, wherein the gas-enrichment assembly is configured for substantially dissolving the treatment gas into the wastewater to a desired gas content, the desired gas content generally increasing with an operating pressure of the gas-enrichment assembly.

Claim 25 (withdrawn): The apparatus of claim 24, wherein the desired gas content ranges from approximately 275 to 880 ppm for operating pressures of approximately 100 to 300 psi.

Claim 26 (withdrawn): The apparatus of claim 25, wherein the treatment gas comprises oxygen.

Claim 27 (withdrawn): The apparatus of claim 1, wherein the gas-enrichment assembly comprises:

a pressurizable chamber having a gas inlet and a gas-enriched fluid outlet; and
an atomizer assembly disposed within the pressurizable chamber, the atomizer assembly configured for receiving the wastewater and for atomizing the wastewater into the pressurizable chamber.

Claim 28 (withdrawn): The apparatus of claim 27, wherein the atomizer assembly comprises:
a stinger assembly having a conduit adapted to carry the wastewater, and at least one nozzle

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operatively coupled to the conduit to atomize the wastewater into the pressurizable chamber.

Claim 29 (withdrawn): The apparatus of claim 27, wherein the atomizer assembly comprises:
at least one nozzle disposed adjacent an inner wall of the pressurizable chamber, the nozzle
configured for atomizing the wastewater into the pressurizable chamber.

Claim 30 (original): The apparatus of claim 1, wherein the delivery assembly comprises:
a fluid conduit; and
a nozzle coupled to the fluid conduit.

Claim 31 (withdrawn): The apparatus of claim 30, wherein the fluid conduit comprises a hose.

Claim 32 (withdrawn): The apparatus of claim 30, wherein the nozzle comprises a plurality of
fluid passageways configured to expel the gas-enriched fluid in a substantially bubble-free
manner.

Claim 33 (withdrawn): The apparatus of claim 32, wherein the fluid passageways have cross-
sectional areas and lengths that are adapted to provide a laminar flow and to substantially
preserve a dissolved gas content of the treatment gas in the gas-enriched fluid, while preventing
excess clogging of the fluid passageways.

Claim 34 (withdrawn): The apparatus of claim 32, wherein the fluid passageways comprise
cylindrical conduits having a length of approximately 1.5 inches and a diameter of approximately
0.005 inches.

Claim 35 (withdrawn): The apparatus of claim 30, wherein the nozzle comprises:
a plurality of stacked plates defining a plurality of fluid channels therebetween, the fluid
channels having an inlet fluidically coupled to the fluid conduit and having an outlet for
expelling the gas-enriched fluid.

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Claim 36 (withdrawn): The apparatus of claim 35, wherein the stacked plates comprise a substantially flat section.

Claim 37 (withdrawn): The apparatus of claim 35, wherein the stacked plates comprise a substantially conical section.

Claim 38 (original): The apparatus of claim 30, wherein the nozzle comprises:
a plurality of capillaries, each of the capillaries having an inlet fluidically coupled to the fluid conduit and having an outlet for expelling the gas-enriched fluid.

Claim 39 (original): The apparatus of claim 38, wherein the capillaries have an inner diameter of approximately 150 to 450 microns.

Claim 40 (original): The apparatus of claim 38, wherein the capillaries are grouped into a plurality of capillary bundles.

Claim 41 (original): The apparatus of claim 40, wherein the capillary bundles comprise a bonding material disposed about the capillary bundles.

Claim 42 (withdrawn): The apparatus of claim 1, comprising at least one filter assembly coupled to the gas-enrichment assembly.

Claim 43 (withdrawn): The apparatus of claim 42, wherein the filter assembly comprises a series of increasingly fine filters.

Claim 44 (withdrawn): The apparatus of claim 42, wherein the filter assembly comprises a 150 micron filter.

Claim 45 (withdrawn): The apparatus of claim 42, wherein the filter assembly comprises a self-cleaning filter.

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Claim 46 (withdrawn): The apparatus of claim 42, wherein the filter assembly is disposed between the gas-enrichment assembly and a wastewater inlet.

Claim 47 (withdrawn): The apparatus of claim 42, wherein the filter assembly is fluidically coupled to the delivery assembly for filtering the gas-enriched fluid.

Claim 48 (withdrawn): The apparatus of claim 1, comprising a control system coupled to the gas-enrichment assembly and coupled to the delivery assembly, the control system at least providing control of a wastewater flowrate and a treatment gas flowrate entering the gas-enrichment assembly, and control of a gas-enriched wastewater flowrate exiting the gas-enrichment assembly through the delivery assembly.

Claims 49-62 (canceled)

Claim 63 (currently amended): A wastewater treatment facility comprising:
a gas-enrichment assembly adapted to receive a supply of wastewater and a supply of treatment gas, wherein the gas-enrichment assembly is configured to gas-enrich the wastewater to a desired content of the treatment gas in a substantially bubble free manner to generate a gas-enriched wastewater wherein the gas-enriched wastewater is gas-supersaturated by the treatment gas; and
a delivery assembly coupled to the gas-enrichment assembly to receive the gas-enriched wastewater from the gas-enrichment assembly and in fluid communication with untreated wastewater that expels the gas-enriched wastewater into untreated wastewater in a substantially bubble-free manner and capable of raising the concentration of the treatment gas in the untreated wastewater to hyperbaric levels.

Claim 64 (original): The facility of claim 63, comprising a mounting assembly configured to support the gas-enrichment assembly and the delivery assembly.

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Claim 65 (original): The facility of claim 64, wherein the mounting assembly is configured for fixed mounting at a stationary wastewater treatment site.

Claim 66 (original): The facility of claim 64, wherein the mounting assembly is configured to be coupled to a mobile deployment system.

Claim 67 (original): The facility of claim 66, wherein the mobile deployment comprises a motor driven vehicle.

Claim 68 (original): The facility of claim 66, wherein the mobile deployment system comprises a trailer configured for towing behind a motor driven vehicle.

Claim 69 (currently amended): The facility of claim 66, wherein the mobile deployment system comprises a at least one cart.

Claim 70 (withdrawn): The facility of claim 63, comprising a treatment gas supply configured to provide treatment gas for the gas-enrichment assembly.

Claim 71 (withdrawn): The facility of claim 63, wherein the gas-enrichment assembly comprises:

a pressurizable chamber having a gas inlet and a gas-enriched fluid outlet; and
an atomizer assembly disposed within the pressurizable chamber, the atomizer assembly configured for receiving the wastewater and for atomizing the wastewater into the pressurizable chamber.

Claim 72 (withdrawn): The facility of claim 63, wherein the delivery assembly comprises:

a fluid conduit; and
a nozzle coupled to the fluid conduit.

Claim 73 (withdrawn): The facility of claim 66, wherein the nozzle comprises a plurality of

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fluid passageways configured to expel the wastewater, at the desired gas content, in a substantially bubble-free manner.

Claim 74 (withdrawn): The facility of claim 63, comprising at least one filter assembly for filtering the wastewater.

Claim 75 (withdrawn): The facility of claim 63, comprising a control system coupled to the gas-enrichment assembly and coupled to the delivery assembly, the control system at least providing control of the desired gas content and control of an exit flowrate of wastewater expelled through the delivery assembly.

Claim 76 (previously presented): The apparatus of claim 1, wherein the delivery assembly is fluidly connected to the wastewater in such a way that allows a transfer of the treatment gas from the gas-enriched fluid to the wastewater.

Claim 77 (previously presented): The wastewater treatment facility of claim 63, wherein the delivery assembly is fluidly connected to the untreated wastewater in such a way that allows a transfer of the treatment gas from the gas-enriched wastewater to the untreated wastewater.

Claim 78 (previously presented): An apparatus for treating a wastewater comprising:
a gas-enrichment assembly adapted to receive the wastewater and a treatment gas, wherein the gas-enrichment assembly is configured to generate a gas-enriched fluid; and
a delivery assembly coupled to the gas-enrichment assembly for receiving the gas-enriched fluid from the gas-enrichment assembly, the delivery assembly expelling the gas-enriched fluid in a substantially bubble-free manner, the delivery assembly comprising a fluid conduit and a nozzle coupled to the fluid conduit, wherein the nozzle comprises:
a plurality of capillaries grouped into a plurality of capillary bundles, each of the capillaries having an inlet fluidically coupled to the fluid conduit and having an outlet for expelling the gas-enriched fluid,
wherein the capillary bundles comprise a bonding material disposed about the capillary bundles.

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Claim 79 (previously added): An apparatus for treating a wastewater comprising:
a gas-enrichment assembly adapted to receive the wastewater and a treatment gas, wherein the gas-enrichment assembly is configured to generate a gas-enriched fluid; and
a delivery assembly coupled to the gas-enrichment assembly for receiving the gas-enriched fluid from the gas-enrichment assembly and in fluid communication with the wastewater, the delivery assembly expelling the gas-enriched fluid in a substantially bubble-free manner into the wastewater, the delivery assembly comprising a fluid conduit and a nozzle coupled to the fluid conduit, wherein the nozzle comprises:
a plurality of capillaries grouped into a plurality of capillary bundles, each of the capillaries having an inlet fluidically coupled to the fluid conduit and having an outlet for expelling the gas-enriched fluid.

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REMARKS/ARGUMENTS

Claims 1-48 and 63-79 are pending in this application. Claims 1, 63 and 69 are amended. No new matter has been introduced. Based on the present amendment and following remarks, examination and allowance of claims 1-48 and 63-79 are respectfully requested.

Claim 78 is allowed. Claims 39, 41, 66-69 are objected to as dependent on a rejected base claim, but would be allowable if rewritten in independent form.

Claims 1, 30, 38, 63-64, 76-77 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 3,956,124 to Fast et al. ("Fast").

Fast describes a hypolimnion oxygenation system in which withdrawn water is pressurized, injected with relatively pure oxygen gas and returned to the hypolimnion to improve oxygen content. The system of Fast is operated so as to result in a dissolved oxygen concentration less than supersaturation in the conduit and at the remixing point (col. 3, lines 37-41; col. 8, lines 18-21; and abstract).

Claim 1 has been amended to recite that the gas-enriched fluid is gas-supersaturated by the treatment gas. This feature is absent from, and in fact taught against, in Fast. Claim 63 has been similarly amended. Accordingly, Applicants respectfully submit that claims 1 and 63, and claims 30, 38, 64, and 76-77 depending therefrom, are novel and non-obvious over Fast. Withdrawal of the rejection of these claims under 35 U.S.C. § 102(b) on that basis is requested.

Claim 69 was objected to for recitation of "comprises a at least one cart." In accordance with the Examiner's preference, claim 69 has been amended to recite "comprises at least one cart."

Claims 40 and 79 were rejected under 35 U.S.C. § 112, second paragraph, because the Examiner could not find a difference in scope between the two claims. This rejection is moot

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due to the amendment of claim 1, from which claim 40 depends. The amendment to claim 1 introduces subject matter not made part of allowable claim 79. Accordingly, Applicants respectfully submit that both claims 40 and 79 may now pass to allowance.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.


If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is invited to call the undersigned attorney at the telephone number below to discuss the steps necessary for placing the application in condition for allowance.

General Authorization for Extensions of Time

In accordance with 37 C.F.R. § 1.136(a), Applicants hereby provide a general authorization to treat this and any future reply requiring an extension of time as incorporating a request therefor. Applicants have enclosed a Fee Transmittal along with DynamOx, Inc. Check No. 1143 in the amount of \$55.00 to cover a one-month extension of time fee set in § 1.17(a)(1). Furthermore, Applicants authorize the Commissioner to charge any additional fees due in connection with the filing of this response to our Deposit Account No. 50-1769; Order No. PA074-US.

Respectfully submitted,

Date: October 4, 2004


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MAR 24 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
James Richard Spears et al.

Serial No.: 09/632,530

Filed: August 4, 2000

For: Apparatus and Method for Oxygenating
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CERTIFICATE OF FACSIMILE
37 C.F.R. 1.8

I hereby certify that this correspondence is being transmitted by facsimile to (703) 872-9306; the United States Patent and Trademark Office in accordance with 37 C.F.R. 1.6(d) on the date:

March 24, 2005
Date


Tamara J. McGovern

SUPPLEMENTAL RESPONSE

Sir:

In response to the Office Action dated June 2, 2004, and further to the amendment of October 4, 2004 and response of January 4, 2005, please amend the above-referenced application as follows:

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 11 of this paper.

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AMENDMENTS TO THE CLAIMS

Listing of Claims

Claim 1 (currently amended): An apparatus for treating a wastewater comprising:
a gas-enrichment assembly adapted to receive the wastewater and a treatment gas, wherein the gas-enrichment assembly is configured to generate a gas-enriched fluid wherein the gas-enriched fluid is gas-supersaturated by the treatment gas; and
a delivery assembly coupled to the gas-enrichment assembly for receiving the gas-enriched fluid from the gas-enrichment assembly and in fluid communication with the wastewater, the delivery assembly expelling the gas-enriched fluid in a substantially bubble-free manner into the wastewater and capable of raising the concentration of the treatment gas in the wastewater to hyperbaric levels.

Claim 2 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises municipal reservoir water.

Claim 3 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises industrial waste.

Claim 4 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises lake/pond water.

Claim 5 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises river/stream water.

Claim 6 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises sewage.

Claim 7 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises stormwater runoff.

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Claim 8 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises ground water.

Claim 9 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises aquacultural waters.

Claim 10 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises marine hatchery waters.

Claim 11 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises agricultural waste.

Claim 12 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises pesticides.

Claim 13 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises fertilizers.

Claim 14 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises heavy metals.

Claim 15 (withdrawn): The apparatus of claim 1, wherein the wastewater comprises microorganisms.

Claim 16 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises air.

Claim 17 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises oxygen.

Claim 18 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises ozone.

Claim 19 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises hydrogen.

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Claim 20 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises chlorine.

Claim 21 (withdrawn): The apparatus of claim 1, wherein the treatment gas comprises carbon monoxide.

Claim 22 (withdrawn): The apparatus of claim 1, wherein the gas-enriched fluid is approximately gas-saturated by the treatment gas.

Claim 23 (withdrawn): The apparatus of claim 1, wherein the gas-enriched fluid is gas-supersaturated by the treatment gas.

Claim 24 (withdrawn): The apparatus of claim 1, wherein the gas-enrichment assembly is configured for substantially dissolving the treatment gas into the wastewater to a desired gas content, the desired gas content generally increasing with an operating pressure of the gas-enrichment assembly.

Claim 25 (withdrawn): The apparatus of claim 24, wherein the desired gas content ranges from approximately 275 to 880 ppm for operating pressures of approximately 100 to 300 psi.

Claim 26 (withdrawn): The apparatus of claim 25, wherein the treatment gas comprises oxygen.

Claim 27 (withdrawn): The apparatus of claim 1, wherein the gas-enrichment assembly comprises:

a pressurizable chamber having a gas inlet and a gas-enriched fluid outlet; and
an atomizer assembly disposed within the pressurizable chamber, the atomizer assembly configured for receiving the wastewater and for atomizing the wastewater into the pressurizable chamber.

Claim 28 (withdrawn): The apparatus of claim 27, wherein the atomizer assembly comprises:
a stinger assembly having a conduit adapted to carry the wastewater, and at least one nozzle

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operatively coupled to the conduit to atomize the wastewater into the pressurizable chamber.

Claim 29 (withdrawn): The apparatus of claim 27, wherein the atomizer assembly comprises:
at least one nozzle disposed adjacent an inner wall of the pressurizable chamber, the nozzle
configured for atomizing the wastewater into the pressurizable chamber.

Claim 30 (original): The apparatus of claim 1, wherein the delivery assembly comprises:
a fluid conduit; and
a nozzle coupled to the fluid conduit.

Claim 31 (withdrawn): The apparatus of claim 30, wherein the fluid conduit comprises a hose.

Claim 32 (withdrawn): The apparatus of claim 30, wherein the nozzle comprises a plurality of
fluid passageways configured to expel the gas-enriched fluid in a substantially bubble-free
manner.

Claim 33 (withdrawn): The apparatus of claim 32, wherein the fluid passageways have cross-
sectional areas and lengths that are adapted to provide a laminar flow and to substantially
preserve a dissolved gas content of the treatment gas in the gas-enriched fluid, while preventing
excess clogging of the fluid passageways.

Claim 34 (withdrawn): The apparatus of claim 32, wherein the fluid passageways comprise
cylindrical conduits having a length of approximately 1.5 inches and a diameter of approximately
0.005 inches.

Claim 35 (withdrawn): The apparatus of claim 30, wherein the nozzle comprises:
a plurality of stacked plates defining a plurality of fluid channels therebetween, the fluid
channels having an inlet fluidically coupled to the fluid conduit and having an outlet for
expelling the gas-enriched fluid.

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Claim 36 (withdrawn): The apparatus of claim 35, wherein the stacked plates comprise a substantially flat section.

Claim 37 (withdrawn): The apparatus of claim 35, wherein the stacked plates comprise a substantially conical section.

Claim 38 (original): The apparatus of claim 30, wherein the nozzle comprises:
a plurality of capillaries, each of the capillaries having an inlet fluidically coupled to the fluid conduit and having an outlet for expelling the gas-enriched fluid.

Claim 39 (original): The apparatus of claim 38, wherein the capillaries have an inner diameter of approximately 150 to 450 microns.

Claim 40 (original): The apparatus of claim 38, wherein the capillaries are grouped into a plurality of capillary bundles.

Claim 41 (original): The apparatus of claim 40, wherein the capillary bundles comprise a bonding material disposed about the capillary bundles.

Claim 42 (withdrawn): The apparatus of claim 1, comprising at least one filter assembly coupled to the gas-enrichment assembly.

Claim 43 (withdrawn): The apparatus of claim 42, wherein the filter assembly comprises a series of increasingly fine filters.

Claim 44 (withdrawn): The apparatus of claim 42, wherein the filter assembly comprises a 150 micron filter.

Claim 45 (withdrawn): The apparatus of claim 42, wherein the filter assembly comprises a self-cleaning filter.

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Claim 46 (withdrawn): The apparatus of claim 42, wherein the filter assembly is disposed between the gas-enrichment assembly and a wastewater inlet.

Claim 47 (withdrawn): The apparatus of claim 42, wherein the filter assembly is fluidically coupled to the delivery assembly for filtering the gas-enriched fluid.

Claim 48 (withdrawn): The apparatus of claim 1, comprising a control system coupled to the gas-enrichment assembly and coupled to the delivery assembly, the control system at least providing control of a wastewater flowrate and a treatment gas flowrate entering the gas-enrichment assembly, and control of a gas-enriched wastewater flowrate exiting the gas-enrichment assembly through the delivery assembly.

Claims 49-62 (canceled)

Claim 63 (currently amended): A wastewater treatment facility comprising:
a gas-enrichment assembly adapted to receive a supply of wastewater and a supply of treatment gas, wherein the gas-enrichment assembly is configured to gas-enrich the wastewater to a desired content of the treatment gas in a substantially bubble free manner to generate a gas-enriched wastewater wherein the gas-enriched wastewater is gas-supersaturated by the treatment gas; and
a delivery assembly coupled to the gas-enrichment assembly to receive the gas-enriched wastewater from the gas-enrichment assembly and in fluid communication with untreated wastewater that expels the gas-enriched wastewater into untreated wastewater in a substantially bubble-free manner and capable of raising the concentration of the treatment gas in the untreated wastewater to hyperbaric levels.

Claim 64 (original): The facility of claim 63, comprising a mounting assembly configured to support the gas-enrichment assembly and the delivery assembly.

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Claim 65 (original): The facility of claim 64, wherein the mounting assembly is configured for fixed mounting at a stationary wastewater treatment site.

Claim 66 (original): The facility of claim 64, wherein the mounting assembly is configured to be coupled to a mobile deployment system.

Claim 67 (original): The facility of claim 66, wherein the mobile deployment comprises a motor driven vehicle.

Claim 68 (original): The facility of claim 66, wherein the mobile deployment system comprises a trailer configured for towing behind a motor driven vehicle.

Claim 69 (currently amended): The facility of claim 66, wherein the mobile deployment system comprises a at least one cart.

Claim 70 (withdrawn): The facility of claim 63, comprising a treatment gas supply configured to provide treatment gas for the gas-enrichment assembly.

Claim 71 (withdrawn): The facility of claim 63, wherein the gas-enrichment assembly comprises:

a pressurizable chamber having a gas inlet and a gas-enriched fluid outlet; and
an atomizer assembly disposed within the pressurizable chamber, the atomizer assembly configured for receiving the wastewater and for atomizing the wastewater into the pressurizable chamber.

Claim 72 (withdrawn): The facility of claim 63, wherein the delivery assembly comprises:

a fluid conduit; and
a nozzle coupled to the fluid conduit.

Claim 73 (withdrawn): The facility of claim 66, wherein the nozzle comprises a plurality of

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fluid passageways configured to expel the wastewater, at the desired gas content, in a substantially bubble-free manner.

Claim 74 (withdrawn): The facility of claim 63, comprising at least one filter assembly for filtering the wastewater.

Claim 75 (withdrawn): The facility of claim 63, comprising a control system coupled to the gas-enrichment assembly and coupled to the delivery assembly, the control system at least providing control of the desired gas content and control of an exit flowrate of wastewater expelled through the delivery assembly.

Claim 76 (previously presented): The apparatus of claim 1, wherein the delivery assembly is fluidly connected to the wastewater in such a way that allows a transfer of the treatment gas from the gas-enriched fluid to the wastewater.

Claim 77 (previously presented): The wastewater treatment facility of claim 63, wherein the delivery assembly is fluidly connected to the untreated wastewater in such a way that allows a transfer of the treatment gas from the gas-enriched wastewater to the untreated wastewater.

Claim 78 (previously presented): An apparatus for treating a wastewater comprising:
a gas-enrichment assembly adapted to receive the wastewater and a treatment gas, wherein the gas-enrichment assembly is configured to generate a gas-enriched fluid; and
a delivery assembly coupled to the gas-enrichment assembly for receiving the gas-enriched fluid from the gas-enrichment assembly, the delivery assembly expelling the gas-enriched fluid in a substantially bubble-free manner, the delivery assembly comprising a fluid conduit and a nozzle coupled to the fluid conduit, wherein the nozzle comprises:
a plurality of capillaries grouped into a plurality of capillary bundles, each of the capillaries having an inlet fluidically coupled to the fluid conduit and having an outlet for expelling the gas-enriched fluid,
wherein the capillary bundles comprise a bonding material disposed about the capillary bundles.

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Claim 79 (previously presented): An apparatus for treating a wastewater comprising:
a gas-enrichment assembly adapted to receive the wastewater and a treatment gas, wherein the gas-enrichment assembly is configured to generate a gas-enriched fluid; and
a delivery assembly coupled to the gas-enrichment assembly for receiving the gas-enriched fluid from the gas-enrichment assembly and in fluid communication with the wastewater, the delivery assembly expelling the gas-enriched fluid in a substantially bubble-free manner into the wastewater, the delivery assembly comprising a fluid conduit and a nozzle coupled to the fluid conduit, wherein the nozzle comprises:
a plurality of capillaries grouped into a plurality of capillary bundles, each of the capillaries having an inlet fluidically coupled to the fluid conduit and having an outlet for expelling the gas-enriched fluid.

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Reply to Office Action of June 2, 2004

PATENT
PA074-US

REMARKS/ARGUMENTS

Claims 1-48 and 63-79 are pending in this application. Claims 2-29, 31-37, 42-48, and 70-75 were withdrawn from consideration. Claims 1, 63 and 69 are amended. Support for the amendments can be found in the specification, for instance, at page 33, lines 10-12, page 33, lines 18-19, and claim 23. No new matter has been introduced. Based on the present amendment and following remarks, examination and allowance of claims 1-48 and 63-79 are respectfully requested.

In an Office Communication dated March 15, 2005, the Examiner notified Applicant that the Amendment originally filed October 4, 2004, was considered not fully responsive. Although the Applicant does not agree that the Amendment of October 4, 2004 was not a *bona fide* attempt to respond to the Office Action of June 2, 2004, Applicant herein provides a Supplemental Response believed acceptable to the Examiner. This Supplemental Response includes all amendments previously presented in the Amendment of October 4, 2004 and the Response of January 4, 2005.

Because the notice of March 15, 2005 was issued after the six (6) month statutory period to reply to the Office Action of June 2, 2004, the application apparently went abandoned. Therefore, Applicant concurrently files the accompanying petition to revive the abandoned application and submits this Supplemental Response to the June 2, 2004 non-final Office Action.

Claims 1, 30, 38, 63-64, 76-77 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 3,956,124 to Fast et al. ("Fast").

Fast describes a hypolimnion oxygenation system in which withdrawn water is pressurized, injected with relatively pure oxygen gas and returned to the hypolimnion to improve oxygen content. The system of Fast is operated so as to result in a dissolved oxygen concentration less than supersaturation in the conduit and at the remixing point (col. 3, lines 37-41; col. 8, lines 18-21; and abstract). The Fast apparatus comprises an intake conduit 15, through

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which water of the hypolimnion is withdrawn. The withdrawn water is conducted to a pump 16 on the shore. A pressurized stream of water leaves the pump through conduit 17 and is infused with gaseous oxygen at a juncture 19 with gaseous oxygen conduit 18 (col. 4, lines 3-8).

At juncture 19, gaseous oxygen from gaseous oxygen conduit 18 is diffused or sparged into the water withdrawn from the hypolimnion (col. 4, lines 26-28). However, the amount of gaseous oxygen added to the water is not so high that the gas is not able to become substantially completely dissolved in the pumped water. The oxygenated water is then conducted through conduit 28 back to the hypolimnion and discharged at a point remote from the inlet of conduit 15 (col. 4, lines 49-52).

An embodiment of the present invention, as claimed in claim 1, is directed to an apparatus for treating wastewater which comprises a gas-enrichment assembly and a delivery assembly in which the gas-enrichment assembly is adapted to receive the wastewater and a treatment gas; the gas-enrichment assembly is configured to generate a gas-enriched fluid; and the delivery assembly expels the gas-enriched fluid in a substantially bubble-free manner into the wastewater and is capable of raising the concentration of the treatment gas in the wastewater to hyperbaric levels.

Claim 1 has been amended to recite that "the gas-enriched fluid is gas-supersaturated by the treatment gas." Not only is this feature not described in Fast, it is in fact necessarily absent from the Fast system.

An objective of the Fast system is to oxygenate the hypolimnion without producing excessive gas bubbles or destroying thermal stratification of the water body (col. 3, lines 15-18). One of the ways the objective of Fast is met is by maintaining an oxygen gas injection rate below that which would result in oxygen supersaturation of the withdrawn water at the pressure in the hypolimnion at the point of remixing (col. 3, lines 37-41). The pressure generated by pump 16 must be sufficient to overcome the hydrostatic pressure head of the hypolimnium at the point of exit and frictional head loss in conduits 17 and 28.

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Accordingly, the pressure profile of the oxygenated water in return conduit 28 is such that the pressure declines along the length of return conduit 28 from the point of its formation at junction 19 to the point of remixing at the exit of the return conduit, with the pressure condition at the point of remixing necessarily being the lowest. Since the oxygen content of the water is maintained below supersaturation at the exit point (the point with the lowest pressure), and since, for a given oxygen gas injection rate, supersaturation is reached when the pressure condition drops below the equivalent partial pressure of the oxygen gas dissolved in the water (or to a pressure at which the oxygen content exceeds the oxygen solubility in the water at that pressure), the oxygenated water in the return conduit is necessarily always maintained above a pressure that would result in a supersaturated condition.

Since claim 1 requires the gas-enriched fluid to be "gas-supersaturated by the treatment gas," and this feature is necessarily absent from the Fast system, claim 1 is not anticipated by Fast. Accordingly, withdrawal of the rejection of claim 1 over Fast is respectfully requested.

Claims 30 and 76 are dependent upon amended claim 1 and are believed patentable for at least the same reasons as given above in connection with claim 1. Claim 38 depends from claim 30 and is also believed patentable for at least the same reasons as claim 30.

Claim 63 has been amended in a manner similar to amended claim 1. Claim 63 is directed to a wastewater treatment facility comprising a gas-enrichment assembly adapted to gas-enrich wastewater with a treatment gas and a delivery assembly which expels gas-enriched wastewater into untreated wastewater in a substantially bubble-free manner and is capable of raising the concentration of the treatment gas in the untreated wastewater to hyperbaric levels. The gas-enrichment assembly is configured to generate a gas-enriched wastewater that is "gas-supersaturated by the treatment gas." Since, as described above in connection with claim 1, Fast does not have a feature of gas-supersaturated wastewater, claim 63 is not anticipated by Fast.

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Claim 63 is thus believed patentable for at least the same reasons as given above in connection with claim 1. Claims 64 and 77 both depend from claim 83 and are believed patentable for at least the same reasons as claim 63.

Accordingly, Applicants respectfully submit that claims 1 and 63, and claims 30, 38, 64, and 76-77 depending therefrom, are novel and non-obvious over Fast. Withdrawal of the rejection of these claims under 35 U.S.C. § 102(b) is respectfully requested.

Claims 39, 41, and 66-69 are objected to as dependent on a rejected base claim, but would be allowable if rewritten in independent form. As discussed above, the rejections of base claims 1 and 63 underlying claims 39, 41, and 66-69, are believed overcome. Accordingly, claims 39, 41, and 66-69 are believed allowable as written.

Claim 40 or 79, but not both, were indicated as allowable, if amended to overcome the following rejection under 35 U.S.C. § 112, second paragraph.

Claims 40 and 79 were rejected under 35 U.S.C. § 112, second paragraph, because the Examiner could not find a difference in scope between the two claims. This rejection is believed moot due to the amendment of claim 1, from which claim 40 depends. The amendment to claim 1 introduces subject matter into claim 40 that is not part of otherwise allowable claim 79. Claim 40 now contains the limitation of amended claim 1 that "the gas-enriched fluid is gas-supersaturated by the treatment gas." Thus claim 40 is believed allowable for at least the same reasons given above in connection with claim 1. With the amendment to the scope of claim 40, claims 40 and 79 contain different limitations and have clearly different scopes.

Thus, the rejection of claims 40 and 70 under 35. U.S.C. § 112, second paragraph. is believed overcome and both claims 40 and 70 are believed allowable. Withdrawal of the rejection of claims 40 and 70 under 35. U.S.C. § 112, second paragraph, is respectfully requested.

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Claim 69 was objected to for recitation of "comprises a at least one cart." In accordance with the Examiner's stated preference, claim 69 has been amended to recite "comprises at least one cart." Accordingly, claim 69 is believed to be unobjectionable.

It is noted with appreciation that claim 78 is allowed.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

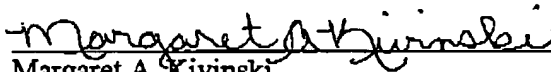
If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is invited to call the undersigned attorney at the telephone number below to discuss the steps necessary for placing the application in condition for allowance.

General Authorization for Extensions of Time

In accordance with 37 C.F.R. § 1.136(a), Applicants hereby provide a general authorization to treat this and any future reply requiring an extension of time as incorporating a request therefor. Furthermore, Applicants authorize the Commissioner to charge any additional fees due in connection with the filing of this response to our Deposit Account No. 50-1769; Order No. PA074-US.

Respectfully submitted,

Date: March 24, 2005


Margaret A. Kivinski
Reg. No. 38,517
TherOx, Inc.
2400 Michelson Drive
Irvine, California 92612
(949) 757-1999

PTO/SB/17 (12-04v2)

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).**FEE TRANSMITTAL**
For FY 2005☒ Applicant claims small entity status. See 37 CFR 1.27**TOTAL AMOUNT OF PAYMENT** (\$) 250.00**Complete if Known**

Application Number	09/632,530
Filing Date	August 4, 2000
First Named Inventor	James Richard Spears
Examiner Name	Barry, Chester T.
Art Unit	1724
Attorney Docket No.	PA074-US

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 50,1769 Deposit Account Name: TherOx, Inc.

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☒ Credit any overpayments

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FEE CALCULATION**1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES**Fee Description**

Each claim over 20 (including Reissues) _____

Each independent claim over 3 (including Reissues) _____

Multiple dependent claims _____

Fee (\$)	Small Entity Fee (\$)
50	25
200	100
360	180

Total Claims _____ **Extra Claims** _____ **Fee (\$)** _____ **Fee Paid (\$)** _____

- 20 or HP = _____ x _____ = _____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims _____ **Extra Claims** _____ **Fee (\$)** _____ **Fee Paid (\$)** _____

- 3 or HP = _____ x _____ = _____

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3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets _____ **Extra Sheets** _____ **Number of each additional 50 or fraction thereof** _____ **Fee (\$)** _____ **Fee Paid (\$)** _____

- 100 = _____ / 50 = _____ (round up to a whole number) x _____ = _____

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Other (e.g., late filing surcharge): Petition under 37 CFR 1.17(l) _____

Fees Paid (\$)

250.00

SUBMITTED BY

Signature	<i>Margaret A. Kwinski</i>	Registration No. (Attorney/Agent)	38,517	Telephone (949) 757-1999
Name (Print/Type)	Margaret A. Kwinski, P.E., Esq.	Date	March 24, 2005	

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Complete if Known

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Attorney Docket No.	PA074-US

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☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____
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For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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Each independent claim over 3 (including Reissues)
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Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
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- 20 or HP =	x	=	
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Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
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- 3 or HP =	x	=	
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Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
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- 100 =	/ 50 =	(round up to a whole number) x	=	
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4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Other (e.g., late filing surcharge): Petition under 37 CFR 1.17(l)**Fees Paid (\$)**

250.00

SUBMITTED BY

Signature	<u>Margaret A. Jivinski</u>	Registration No. (Attorney/Agent)	38,517	Telephone (949) 757-1999
Name (Print/Type)	Margaret A. Jivinski, P.E., Esq.	Date	March 24, 2005	

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